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ABSTRACT

A review of literature (1984 to 1991) was undertaken to: (1) determine the status of research pertaining to the utilization of student evaluations of teaching; (2) evaluate the specific studies that pertain to use of evaluations for the improvement of science teaching; and (3) examine the instruments available for use by science educators. Eighty percent of the 167 studies were found to be in higher education, with a large number of these studies investigating and generally confirming the reliability and validity of student evaluations. Only 4 percent of the studies concerned science classrooms, and there was a lack of research addressing the utility of feedback from evaluations for teaching improvement. Few instruments were found that are specifically designed for use in science classrooms. Tables summarize the results. Contains 33 references. (Author/MDH)

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Student Evaluation of Teacher Performance: A Review of Literature and Instruments for Science Educators

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ABSTRACT

A review of literature (1984 to 1991) was undertaken to: (1) determine the status of research pertaining to the utilization of student evaluations of teaching; (2) evaluate the specific studies that pertain to use of evaluations for the improvement of science teaching; and (3) examine the instruments available for use by science educators. Eighty percent of the studies were found to be in higher education, with a large number of these studies investigating and generally confirming the reliability and validity of student evaluations. Only four percent of the studies concerned science classrooms, and there was a lack of research addressing the utility of feedback from evaluations for teaching improvement. Few instruments were found that are specifically designed for use in science classrooms. Tables summarize the results.

Objectives

A review of the literature was undertaken to: (1) determine the status of research on student evaluation of teaching in general and in science classes specifically; (2) determine the usefulness of this type of research as an indication of teacher characteristics, teaching behaviors, and teaching methods considered by students to be important in effective science teaching; (3) determine the potential use of feedback from student evaluations by the science teacher for improvement of teaching; (4) determine the extent of the use of student evaluations to provide information for science education research; and (5) determine the types of instruments available to science teachers and researchers at this time to acquire input from students. This paper presents a review of studies pertaining to student evaluation of teachers published between 1984 and 1991. The beginning date for this search was chosen because it marked the year of publication of a major review article by H. W. Marsh in which he described student ratings as useful in research as well as for diagnostic feedback because they provide both a process-description measure and a product measure. He noted additionally that their use in research on teaching has been under-utilized. A primary objective of this review is to ascertain the current level of use of student evaluations by researchers interested in improving the teaching of science.

Significance

College students have been evaluating faculty since the introduction of the first formal published evaluation form, the Purdue Rating Scale of Instruction, in 1926 (Darr, 1977). At the post-secondary level, student ratings are the most common source of data used to evaluate teaching effectiveness, distantly followed by peer ratings, administrative ratings, and instructor self-

evaluations. Because of their widespread use, thousands of papers have been written on students' evaluations. These papers address the design, development and research pertaining to the evaluation instrument; the validity, reliability, generalizability, and potential biases of student ratings; and the utility of student evaluations in the improvement of teaching. Marsh (1984) reported that the studies provide insight but cannot be easily summarized, and that opinions of the role of students' evaluations range from "reliable, valid, and useful" to "unreliable, invalid, and useless." Marsh and other reviewers (Cohen, 1981; Darr, 1977; Levinson-Rose & Menges, 1981) concluded, however, that given an appropriately designed instrument, student evaluations are reliable and stable, primarily a function of the instructor, valid against a variety of indicators of effective teaching, relatively unaffected by potential biases, and useful for improving teaching effectiveness. These reviews and others do not, however, examine the contribution that student evaluations of teaching can make specifically to the understanding and improvement of the teaching of science.

The question of the utility of student evaluations for the improvement of science teaching is predicated on the assumption that there is something wrong (ineffective) with science teaching as it occurs now. This assumption is supported by data from the Third Assessment of Science of the National Assessment of Educational Progress (Yager & Penick, 1984), as well as from other sources of achievement and attitude data, and has led to an overall move toward reform in science education. The current focus of science education research on the student, as evidenced by research on the constructivist learning model, gender-bias, misconceptions, attitudes, and use of interview methodology, would seem to indicate that educators are giving more credence to student opinions about all aspects of their education.

Students have a lot to say to science educators about effective teaching. They are, after all, professional teacher-watchers, and they know when they are learning and can describe characteristics of an effective teacher. The "ideal science teacher" as described by students is very nearly the same as that described by science education researchers and teachers (Al Methen & Wilkinson, 1986; Brekelmans, Wubbels, & Creton, 1990; Tairab & Wilkinson, 1991). Both groups seem to know "what should be." Students are in a perfect position to describe "what is." Science educators need to determine how to best elicit information from students and then how to utilize that information to improve science education. The use of student evaluations of teachers offers one method that can be used at more than just one educational level.

Design and Procedures

A computer search of material included in the Educational Research and Information Clearinghouse (ERIC) data base was conducted, starting with the major descriptor, "student-evaluation-of-teacher-performance." The references investigated included all of those with this major descriptor appearing in ERIC between 1984 and 1991. During those eight years, 589 references appeared with that descriptor in the ERIC data base. Of these references, only those representing original research where student evaluation of teaching was of primary importance to the study were investigated. Review articles, editorials and opinion papers, and those describing an overall evaluation program or evaluations of departments, programs, or specific courses were not included for review. Those conducted in professional (medical, dental, etc.) or graduate schools were not included because of their limited application. This left a total of 167 to be examined.

Each reference was then categorized according to: (1) educational level (elementary, secondary, higher); (2) specific subject area if included or of importance; (3) the focus, goal or purpose of the study; and (4) type or name of evaluative instrument used. The categories for focus of study included: (1) instrumentation studies (developing and testing of an instrument, reliability and validity studies, bias and halo effects); (2) descriptive studies in which student evaluations were used to indicate students' perceptions of teaching behaviors or teaching effectiveness; (3) studies in which student evaluations were used to access teaching change after an intervention or after feedback from a previous rating; (4) studies of teacher attitudes towards use of student ratings; (5) studies of student attitudes towards these evaluations; and (6) studies relating student achievement, student learning, or cognitive styles to student evaluations. Of the total number of studies, only fourteen were selected by ERIC search when the second descriptors ("science instruction," science education," or "science teachers") were added, and only eight of these met the above criteria. These studies were investigated further to ascertain what types of information they contributed to science education. In addition, selected science education research journals were manually searched in order to evaluate the reliability of the major descriptor in identifying articles on the topic of student evaluations of their teachers.

Learning environment studies were generally not identified using these descriptors and it was not the intention of this assessment to evaluate those studies that appeared in the recent NARST monograph on learning environments (Fraser, 1989). These studies investigate the psychosocial environment of the classroom, and they naturally include a great deal of information on student perceptions of teachers and teaching behavior. This

review is limited, however, to instruments and studies designed as student evaluations or ratings of teachers and their behaviors.

Findings

Findings from the literature search and analysis of selected studies identified by the descriptor "student-evaluation-of-teacher performance" can be summarized as follows:

1. About 80% of the studies concern higher education.
2. The studies are not highly specific according to subject area. A large number of studies are conducted in psychology classes. Only 4% of the studies were specifically conducted in science classrooms with the purpose of improving science education. Other disciplines were also represented by few studies.
3. Evaluation instruments are generally not included in articles, although sample items may be. Most instruments utilized are researcher-designed; some are those routinely used at the university where the research was conducted.
4. Approximately 30% of the studies investigated teacher characteristics and teaching styles that resulted in favorable evaluations by students.
5. Approximately 60% of the studies involved development and testing of evaluation instruments, or looking at the reliability and validity of student evaluations, including the effects of bias on the results.
6. Approximately 4% of the studies investigated the use of student evaluations for improvement of teaching, using evaluation feedback as rationale for change.
7. The remaining categories also received relatively little attention.

The studies targeting science education were conducted more frequently in secondary classrooms, and several presented the results of evaluation of teachers known to be exemplary. One new instrument that was constructed for use in science classrooms, the Science Student Perception Questionnaire (SSPQ), was used in several studies, having particular application to the evaluation of student teachers by students. Several important studies relating to student evaluations of science teachers were not identified through ERIC using the descriptor, but were found by manual searches. These articles related to student evaluations of teachers, although the terminology used was "student perceptions" of teachers and their behavior. The term "evaluation" may carry some negative connotations such that authors do not utilize the term in designating ERIC descriptors. To use "student evaluation of teacher performance" as a descriptor would clearly help other interested researchers.

Conclusions

In order to determine the usefulness of student evaluations, one must be assured of their reliability (that they are dependable measures of what goes on in a classroom, measured by their internal consistency, interrater agreement, stability, and generalizability), their validity (that they are an accurate measure of teaching effectiveness), and that they are not biased. Much of the literature still focuses on these issues, primarily at the college level. Results generally support the claim that student evaluations are reliable and valid indicators of effective teaching when an appropriately designed instrument is used. Teachers, however, appear to dismiss the usefulness of student evaluations perhaps because of the large number of studies that report context-dependent bias, which appears to be of minor

overall importance. While there is evidence that some variables, teacher personality for example, do influence student ratings slightly, it is generally suggested that these may actually relate to the teaching effectiveness of the instructor as perceived by the individual student, and as such are valid (Jones, 1989). One very interesting study was that of Runco & Thurston (1987), who used a method of social validation to construct an instrument based on students' ideas of effective teaching and found that it corresponded well to the evaluation form used by the university.

There is more limited research of this type at the elementary and secondary levels, and it is unclear whether student maturity would preclude the use of these kinds of data. Data using the evaluation form IDEA-H would suggest that secondary students are able to give reliable and valid evaluations of their teachers (Aubrecht, Hanna, & Hoyt, 1986), and research with the SSPQ supports this contention (Jegede, 1989; Tairab & Wilkinson, 1991). Some authors have found that elementary students are reliable raters of teaching behavior (Driscoll et al., 1985; Kronowitz, 1984), and one rating form was identified, the Primary Grade Pupil Report (Driscoll et al.). Payne (1984), on the other hand, found elementary students did not give valid evaluations of student-teachers' performance. While this line of research at the college level is becoming somewhat redundant, there is much that needs to be done to ascertain the reliability and validity of student ratings at the secondary and elementary levels. Evaluations appear to be fairly accurate measures of classroom events and, as such, should be important indicators of behaviors that students at all levels perceive as important to their learning.

The lack of research on the potential of using student evaluations of teaching specifically in the science classroom is cause for concern. Science classes have special characteristics that may have an influence on the type of

evaluations utilized and uses of the evaluations. For example, science classes have laboratories; science courses are perceived by many students as being especially difficult; science teachers have traditionally required learning a large body of factual information; and there are substantial differences between the intended, translated, and achieved curriculum. Student perceptions of teachers should be of concern to educators and the various forms of student evaluations of teachers and teaching could play an important role in improving science education. Although students have been asked to give their opinions and perceptions of their classroom and teachers, few instruments have been constructed that are specifically designed for use with science students. The construction and validation of the Science Students Perception Questionnaire should have considerable usefulness in providing relevant feedback to science teachers as well as providing information for science education researchers. The challenge to educators is to discover how to use evaluation information to improve science teaching. Marsh (1984) appreciated the potential use of student evaluations in research on teaching, but there is little evidence of research activity in this area.

One area of research that is needed is to study the effects of active intervention (such as consultations) for the purpose of improvement of teaching skills on the future evaluations of those teachers. An interesting study by DeNeve (1991) looked at this problem, especially as it relates to the instructor's own subjective theory of lecturing. He proposed a model that states that instructors consider changing teaching behavior following an evaluation only if the change supports the instructor's own subjective theory. The model supports the use of feedback with consultation. This line of research could be most exciting, especially as it relates to preservice training and the development of one's own theory of teaching.

Some studies indicate that student satisfaction, involvement, and motivation may be enhanced if they were asked to contribute their opinions for the purpose of improved instruction, and this process could affect student behavior as well as academic performance. However, there are very few studies of this type.

Many researchers and practitioners would also be interested in the correlation of intervention with achievement of students in those classes. Entwistle & Tait (1990) conducted a study to investigate the relationship between students' approaches to learning and their evaluations of teaching. They found that the way a student defines good teaching depends on the depth of the approach to learning of that student. They noted four orientations to learning: (1) meaning orientation, a deep approach, with internal motivation; (2) achieving orientation, a strategic approach with achievement as a goal; (3) reproducing orientation, a surface approach with a fear of failure; and (4) non-academic orientation, with low self-confidence and negative attitudes. It is necessary to add items to the typical evaluation that get at those differences. This is another study that seems to be at the forefront of research, using student evaluations as a way to develop models of teaching and learning and of understanding that can lead to overall improvement of instruction.

The studies that appear to hold considerable promise in not only improving teaching but also student learning, are those studies in which the evaluation items are linked directly to a clearly conceptualized and explained model of student learning and the teaching needed to promote learning.

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Data Set for This Review

Year of Publication	1984	1985	1986	1987	1988	1989	1990	1991
Number of references identified by ERIC descriptor	85	76	77	94	78	61	71	47
Number of those meeting selection criteria	21	19	25	23	19	22	18	20
Number of references identified by manual search	0	0	2	1	1	3	3	0
Total references available for review	21	18	23	22	19	23	20	19
Distribution by education level:								
A. Higher	19	13	14	20	13	17	12	16
B. Secondary	0	3	7	1	4	5	6	2
C. Elementary	2	1	1	0	2	0	1	0
D. Combination	0	1	1	1	0	1	1	1
Distribution by type of study:								
A. Instrumentation studies	15	11	10	14	13	10	11	14
B. Descriptions of teacher behaviors identified by SET	6	4	10	4	6	11	8	4
C. Studies of teacher change measured by SET	1	0	2	0	1	1	0	2
D. Studies of teacher attitudes toward SET	1	1	2	1	0	1	0	2
E. Studies of student attitudes toward SET	1	1	1	2	0	0	1	0
F. Studies of learning and SET	1	4	1	2	1	4	3	2

NOTE: The totals do not add up to the number of studies because some studies were assigned to more than one category.

SELECTED STUDIES COMBINING SCIENCE AND SET

STUDIES REVIEWED	PURPOSE	SAMPLE	METHOD	CONCLUSION
Al Methen & Wilkinson, 1986	To determine teaching behaviors associated with good science teaching by h.s. students in Kuwait	N = 162 N = 129 16 yr old science students	Construction of Science Students Perception Questionnaire (SSPQ) Test of SSPQ	a. SSPQ = source of valuable data b. Student views of effective science teacher = similar to views of science educators
Brekelmans, Wubbels & Creton, 1990	To compare student perceptions of teacher behaviors using 2 curricula	N = 1105 h.s. physics students (Netherlands)	Questionnaire on Teacher Interaction completed by students & teachers Student cognitive outcomes test	a. No large differences between teaching behaviors for 2 curricula. b. Strong relationship between teacher interactional behavior & student affective and cognitive outcomes.
Holstein, Scherz & Yager, 1986	To compare US & Israel science students' attitudes toward science teachers, classes	N = 2500 (US) 13 yr olds N = 2500 (US) 17 yr olds N = 530 (Israel) 13 yr olds N = 340 (Israel) 17 yr olds	Affective items from Third Assessment of Science by NAEP	a. Students' perceptions of science influenced by curriculum, teacher behavior & teacher preparation
Jegede, 1989	To determine validity & reliability of SSPQ & ISSPQ (integrated SSPQ) To study students' rating of teachers for effective teaching	N = 2110 secondary students (Nigeria)	SSPQ & ISSPQ administered in each class	a. SSPQ & ISSPQ = reliable & valid b. H.s. students = effective raters, can access teacher characteristics
Tairab & Wilkinson, 1991	To compare student perceptions of student-teachers to those of supervisors. To compare perceptions of more advanced & less advanced students	N = 284 h.s. bilology students of 5 student-teachers	SSPQ in each class University & supervising teacher grades for each student-teacher	a. Student evaluation discriminates between teaching behaviors better than supervisors' grades b. Student evluations are in agreement with supervisor's grades c. Little difference between ratings of levels of students

STUDIES OF TEACHER-CHANGE AS MEASURED BY SET

STUDIES REVIEWED	PURPOSE	SAMPLE	METHOD	CONCLUSION
Jamieson et al., 1986	To test idea that students' expectation of teacher competency influences SET, classroom behavior & achievement	N = 64 11th grade students	3-week unit, new teacher 2 classes = positive expectancy 2 classes = no expectancy SET on day 1 and 15	a. Students in positive expectancy class gave higher evaluation, had more appropriate behavior & received slightly higher grades b. Students influence teaching process
Williams, 1991	To measure effects of a comprehensive training program for teaching assistants (TA's) on SET	N = 27 TA's + their classes	Pre- & Post-SET (Teacher Analysis by Students) Control Group - TA's attend workshop & course Experimental = TA's also receive consultation & mentors	a. All groups show decline in SET b. Decline is slight for experimental group, large for control group c. Training program improved TA's relative SET's
Wilson, 1986	To study the effect of consultation on improving teaching & SET's	N = ? college teachers	Teachers rated high on SET generate ideas of effective methods Ideas passed to low-rated teachers by consultants Pre- & Post-consultation SET's	a. Ratings for low-rated teachers show positive change after consultation b. Teachers need to know what to do in order to improve

STUDIES OF TEACHER ATTITUDES TOWARD SET

STUDIES	PURPOSE	SAMPLE	METHOD	CONCLUSION
Avi-Itzhak & Kremer, 1985-86	To investigate faculty attitudes toward SET To identify relationship between attitudes and teacher status variables	N = 307 college instructors	Questionnaire (researcher constructed)	a. Faculty neither hostile nor positive, but are noncommitted b. Senior, tenure-track faculty show least support for use of SET
Baxter, 1991	To investigate teachers' perceptions of SET using computerized evluation system	N = 306 college teachers	Questionnaire (researcher constructed)	a. Most use SET for feedback on teaching effectiveness b. Most believe SET important, accurate, taken seriously by students c. Most reported teaching changes following SET
DeNeve, 1991	To build an understanding of lecturer's interpretation of SET To formulate model of instructor's subjective theory of teaching	N = 5 college teachers	Interview Evalec SET questionnaire ECSR, self-rating Consultation	a. A dimension is considered for improvement when it is part of instructor's subjective theory of teaching
Franklin & Theall, 1989	To investigate teachers' knowledge and use of SET, and attitudes toward SET	N = 779 college teachers	Questionnaire (researcher constructed)	a. Teachers with a negative attitude toward use of SET generally know less about SET
Kauchak et al., 1985	To investigate teachers' attitudes toward evaluation, including SET	N = 228 elementary and secondary teachers	Interview (N = 60) or questionnaire (n = 168)	a. 3 basic attitudes shown: 1. SET valuable, students exposed to teacher for longest 2. Skeptical, good vs "popular" 3. Doubt students have ability b. High school teachers more favorable toward SET
Piland, 1984	To compare opinions of students, teachers, and administration in relation to SET	N = 607 students N = 130 faculty N = 45 administrators	Questionnaire: Student Evaluation Process Scale (research constructed)	a. Faculty tend to believe SET results impact teaching b. Also tend to believe grading and physical appearance affect SET

STUDIES OF STUDENT ATTITUDES TOWARD SET

STUDIES REVIEWED	PURPOSE	SAMPLE	METHOD	CONCLUSION
Abbott et al., 1990	To examine student satisfaction with processes of collecting SET	N = variable 4 classes for each of 8 procedures	2x2x2 factorial design varying (a) method (group interview vs rating forms), (b) timing (midterm vs end of course), (c) instructor reaction (restricted vs extended)	a. Students more satisfied with group interview method b. Students more satisfied with midterm timing c. Students more satisfied when teacher responds to feedback directly
Marlin, 1987	To investigate students' perceptions of SET at two universities	N = 313 and N = 336 college students	Questionnaire (researcher constructed)	a. Students are fair, accurate b. SET has little effect on teaching or teacher's careers
Miron & Segal, 1986	To investigate students' attitudes about the value of SET	N = 440 college students	Questionnaire (researcher constructed)	a. SET is important b. Students are qualified raters c. SET has little effect on teachers
Piland, 1984	To compare opinions of students, faculty, and administrators concerning SET	N = 440 college students	Questionnaire: Student Evaluation Process Scale (researcher constructed) Context variables noted	a. Students tend to believe that they take SET seriously b. SET does not change teacher performance
Wulff et al., 1985	To investigate students' perceptions of SET and preferences for methods	N = 140 college students	End-of-course student rating (ECSR) (n = 71) Small Group Instructional Diagnosis (SGID) + ECSR (N = 69) Student Perceptions of Evaluating Teacher Effectiveness (researcher constructed)	a. Students consider SET important b. Students prefer SGID because of midterm timing and opportunity for feedback from teachers